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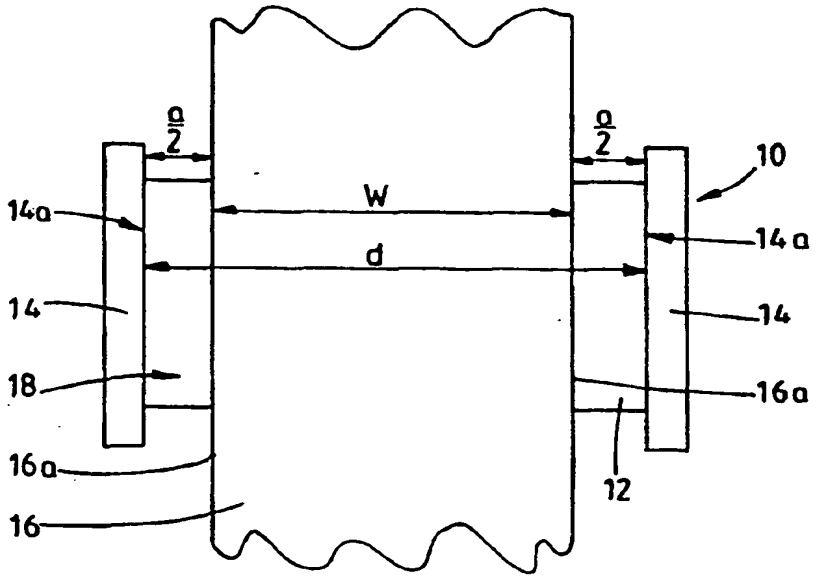

(57) Abstract

A tape guide device comprises a guide element (10) including a pair of abutment surfaces (14a) which face one another and face opposed surfaces of a tape (16) to be guided in use. The abutment surfaces (14a) are spaced apart by an amount greater than a transverse dimensi n f the material (16). An engagement surface (18) is provided between the abutment surfaces (14a). A mechanism (22, 24) oscillates the guide element (10) in the direction of the transverse dimension of said material (16), at an amplitude of oscillation not exceeding the difference between the separation of the abutment surfaces (14a) and the transverse dimension of the material (16), in use.

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GUIDE DEVICE

FIELD OF TECHNOLOGY

This invention relates to a guide device for guiding continuous lengths of material, for example tape, or paper or rubber belts, and in particular to the guidance of magnetic tape. The invention further relates to a method of guiding said material. The guide device is particularly intended for use in positioning magnetic tape with respect to the read/write head and/or other elements forming part of the tape reading/recording mechanism of a tape reader/recorder, and is also suitable for use in guiding materials other than magnetic tape.

BACKGROUND ART

High speed magnetic tape, typically of 2.5cm width and 16μm thickness is often required to be positioned so that a recorded track of the tape slides over the read/write head of a tape reader/recorder to an accuracy of within 2.5μm. Where such a tape is replaced with a second tape, the recorded track(s) of the second tape may have a different lateral position on the tape to that or those of the original tape, and hence the track(s) of the second tape is/are incorrectly positioned with respect to the read/write head of the tape reader/recorder. In order to locate the track(s) of the tape correctly, the tape may be moved in a lateral direction by a distance of up to 200μm.

Such magnetic tape lacks transverse stiffness and hence if a transverse force is applied to an edge of the tape in order to adjust its position, the frictional force between the tape and its tape guide tends to buckle or deform the tape in some other way before movement of the tape relative to the guide occurs. The tape is often required to remain accurately positioned whilst moving past the head at speeds of up to 10m/s either in a forwards or backwards direction.

It is an object of the invention to provide a guide capable of guiding

continuous lengths of material so as to position the material accurately without causing damage thereto.

DISCLOSURE OF THE INVENTION

According to a first aspect of the invention there is provided a guide device comprising (a) a guide element including a pair of abutment surfaces arranged to face one another and to face opposed surfaces of the material to be guided, in use, and being spaced apart by a distance greater than a transverse dimension of the material, and an engagement surface provided between the abutment surfaces, and (b) means for oscillating the guide element in the direction of the transverse dimension of the material in use, the amplitude of oscillation not exceeding the difference between the separation of the abutment surfaces and the transverse dimension of the material.

Since the guide element is arranged to be oscillated in the above described manner, the frictional force between the material and the guide element required to be overcome in order to move the material transversely of its direction of travel is reduced. Hence the position of the material on the guide can be adjusted by applying a force of smaller magnitude to the edge of the material. The risk of buckling or causing other damage to the edge of the material is therefore reduced.

Preferably, the guide element includes a pair of spaced shoulders, the abutment surfaces being provided on the shoulders.

The engagement surface may be planar or curved, but is preferably curved. The guide element preferably comprises a cylindrical body whose periphery defines the engagement surface. The shoulders preferably comprise a pair of radially extending flanges one being provided at each end of the cylindrical body. Such a body may be freely rotatable, rotationally driven or rotationally fixed.

Preferably, the guide device further comprises adjustment means for adjusting the position of the point about which the guide element is arranged to oscillate.

Preferably, the means for oscillating the guide element comprises an armature attached to the guide element, and a solenoid arranged to be electrically energised by a direct current upon which is superimposed an alternating current, the adjustment means comprising means for adjusting the magnitude of the direct current applied to the solenoid.

For a tape within 2.5cm, the amplitude of the oscillatory motion may fall within the range 0.1 to 0.5mm and preferably has a frequency falling within the range 50Hz to 1kHz.

According to a second aspect of the invention there is provided a tape reader and/or recorder comprising a tape reading and/or recording mechanism including a head over which tape passes in use, and a guide device according to the first aspect of the invention positioned so as to guide the tape passing over the head.

According to a third aspect of the invention there is provided a method of guiding continuous lengths of material comprising passing a continuous length of material longitudinally over a guide element of the type including a pair of abutment surfaces arranged to face one another and to face opposed surfaces of the material, in use, and being spaced apart by a distance greater than a transverse dimension of the material, and an engagement surface provided between the abutment surfaces, and oscillating the guide element in the direction of the transverse dimension of the material in use, with an amplitude of oscillation not exceeding the difference between separation of the abutment surfaces and the transverse dimension of the material.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will further be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a cross sectional view of a guide element forming part of a tape guide device for use in guiding magnetic tape according to an embodiment of the present invention;

Figure 2 is a plan view of the guide element of Figure 1; and

Figure 3 is a diagrammatic illustration of a tape guide device including the guide element of Figures 1 and 2.

PREFERRED MODE OF CARRYING OUT THE INVENTION

The tape guide device is for a reel-to-reel tape and comprises a tape guide element 10 (shown in Figures 1 and 2) which comprises a cylindrical body 12 provided with first and second radially extending circumferential flanges 14 disposed at opposite ends of the cylindrical body 12, the flanges 14 being spaced apart by a distance d greater than the width w of the tape 16. Each flange 14 includes a tape edge abutment surface 14a on the surface of the flange 14 facing the other flange 14. It will be understood that in use each tape edge abutment surface 14a faces a respective side edge 16a of the tape being guided by the tape guide device. A part of the peripheral surface 18 of the cylindrical body is arranged to be engaged by the rear surface of the tape 16, ie the surface of the tape 16 which is not being read or recorded upon. The tape guide element 10 is arranged to be freely rotatable about the axis of the cylindrical body 12.

The tape guide element 10 is rotatably supported upon a pair of leaf springs 20, the springs 20 allowing the tape guide element 10 to perform axial movement. An armature 22 is attached to one end of the tape guide element

10, the armature 22 being arranged to be oscillated by a solenoid 24 electrically energised by a direct current upon which is superimposed an alternating current. The use of such a solenoid 24 results in the tape guide element 10 performing oscillatory motion with an amplitude dependant upon the amplitude of the alternating current and the strength of the leaf springs 20, the tape guide element 10 oscillating about a point dependant upon the size of the direct current applied to the solenoid 24 and the strength of the leaf springs 20. The tape guide element 10 is arranged such that, in this embodiment, it performs oscillatory motion having an amplitude a equal to the difference between the separation d of the tape edge abutment surfaces 14a and the width w of the tape 16. In this embodiment, the amplitude a is 0.5mm, the width w is 2.5cm, and therefore d is 2.55cm, and the frequency of oscillation is about 20 OHz.

When the tape 16 is positioned in a tape reading and/or recording device, the position of the tape 16 with respect to the read/write head of the device is adjusted by altering the magnitude of the direct current applied to the solenoid 24. It will be understood that altering the magnitude of the direct current adjusts the position of the point about which the tape guide element 10 oscillates with respect to the read/write head.

Since the tape edge abutment surfaces 14a are separated by a distance d greater than the width w of the tape 16 and the amplitude a of the oscillatory motion is equal to the difference between separation d of the tape edge abutment surfaces 14a and the width w of the tape 16, the tape 16 is urged to adopt a central position in which the side edges 16a of the tape 16 only periodically touch the tape edge abutment surfaces 14a of the flanges 14. Such a central position represents the desired position of the tape 16.

Any tendency for the tape 16 to move transversely out of its central

position is countered by a centralizing force applied to the appropriate side edge 16a of the tape 16 by the respective tape edge abutment surface 14a. The magnitude of such a centralizing force is relatively low because relatively lower dynamic frictional forces are involved rather than relatively higher static frictional forces. Thus tape edge wear is reduced, and the useful life of the tape is increased. Furthermore, the smaller force necessary to maintain the tape 16 in its central position means that there is a reduced risk of tape buckling.

The above described tape guide device can be incorporated within a tape reading and/or recording apparatus to correctly position the tape 16 with respect to the read/write head (by altering the magnitude of the direct current applied to the solenoid 24), and once correctly positioned, to maintain the tape 16 accurately positioned with respect to the read/write head of the device. If the correctly positioned tape 16 is replaced by a second tape 16 having recorded tracks in a different lateral position to that of the original tape 16, the recorded tracks of the second tape 16 will not be positioned correctly with respect of the read/write head. In order to locate the second tape 16 correctly, the magnitude of the direct current applied to the solenoid 24 is adjusted, resulting in the tape guide element 10 oscillating about a new position. The oscillatory motion of the tape guide element 10 results in the tape tending to adopt new a central position corresponding to the correct position of the tracks relative to the read/write head. The adjustment of the position of the point about which the tape guide element 10 oscillates causes the central position of the tape 16 to move with respect to the read/write head, and so accurate positioning of the tape 16 can be attained, the tape experiencing the above described centralizing forces until the tape 16 adopts its new central position.

In the above described embodiment, the tape guide element 10 is freely rotatable and takes the form of a cylindrical body 12 provided with a pair of spaced radially extending flanges 14. In an alternative embodiment, the

tape guide element may be rotationally driven by a suitable motor rather than being freely rotatable. In a further alternative, the tape guide element may be mounted in such a manner that it is not rotatable, in which case it may take a form other than cylindrical, for example a rectangular planar or curved base provided with a pair of spaced ribs.

Although the above described device is for use in guiding magnetic tape past or over the read/write head of a tape reader/recorder, the guide device is also suitable for use in guiding tapes of other materials, paper or rubber belts, or continuous lengths of other materials.

CLAIMS

1 A guide device comprising a guide element (10) including a pair of abutment surfaces (14a) arranged to face one another and to face opposed surfaces of a material (16) to be guided in use, the abutment surfaces (14a) being spaced apart by an amount greater than a transverse dimension of the material (16), and an engagement surface (18) provided between the abutment surfaces (14a), and characterized by means (22, 24) for oscillating the guide element (10) in the direction of the transverse dimension of said material (16), the amplitude of oscillation not exceeding the difference between the separation of the abutment surfaces (14a) and the transverse dimension of the material (16), in use.

2 A guide device as claimed in Claim 1 characterized in that the guide element (10) includes a pair of shoulders (14) spaced apart from one another, the abutment surfaces (14a) being provided on the shoulders (14).

3 A guide device as claimed in Claim 1 or Claim 2 characterized in that the engagement surface (18) is curved.

4 A guide device as claimed in Claim 3 characterized in that the guide element (10) comprises a cylindrical body (12), the engagement surface (18) being defined by the periphery of the cylindrical body (12).

5 A guide device as claimed in Claim 4 characterized in that the abutment surfaces (14a) are defined by a pair of radially extending flanges (14), one being provided at each end of the cylindrical body (12).

6 A guide device as claimed in any one of the preceding claims, characterized by adjustment means for adjusting the position of the point about which the guide element (10) is arranged to oscillate.

7 A guide device as claimed in Claim 6 characterized in that the oscillating means (22, 24) comprises an armature (22) attached to the guide element (10), and a solenoid (24) arranged to be electrically energised by a direct current upon which is superimposed an alternating current, the adjustment means comprising means for adjusting the magnitude of the direct current applied to the solenoid (24).

8 A guide device as claimed in any one of the preceding claims, characterized in that the amplitude of oscillation falls within the range 0.1 to 0.5 mm.

9 A guide device as claimed in any one of the preceding claims, characterized in that the oscillating means (22, 24) is arranged to oscillate the guide element (10) at a frequency within the range 50Hz to 1kHz.

10 A tape reader and/or recorder comprising a tape reading and/or recording mechanism including a head over which tape (16) is arranged to pass, in use, and a guide device for guiding the tape, the guide device comprising a guide element (10) including a pair of abutment surfaces (14a) arranged to face one another and to face opposed surfaces of the tape (16) in use, the separation of the abutment surfaces (14a) being greater than the transverse dimension of the tape (16), and an engagement surface (18) provided between the abutment surfaces (14a), and characterized by oscillating means (22, 24) for oscillating the guide element (10) in the direction of the transverse dimension of the tape (16) at an amplitude of oscillation not exceeding the difference between the separation of the abutment surfaces (14a) and the transverse dimension of the tape (16), in use, for guiding the tape (16) over the head.

11 A method of guiding continuous lengths of material comprising passing a continuous length of the material (16) longitudinally over a guide

element (10) of the type including a pair of abutment surfaces (14a) arranged to face one another and to face opposed surfaces of the material (16), the separation of the abutment surfaces (14a) being greater than the transverse dimension, an engagement surface (18) being provided between the abutment surfaces (14a), and oscillating the guide element (10) in the direction of the transverse dimension at an amplitude of oscillation not exceeding the difference between the separation of the abutment surfaces (14a) and the transverse dimension of the material (16).

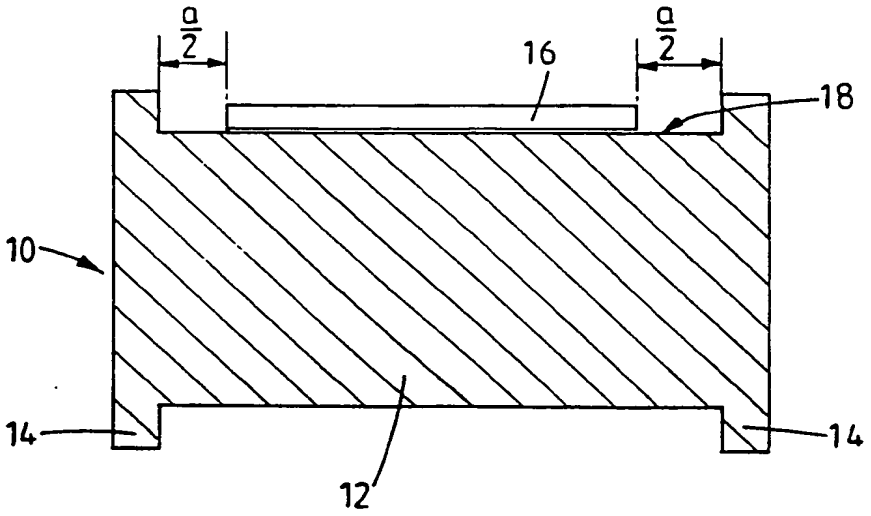

FIG. 1.

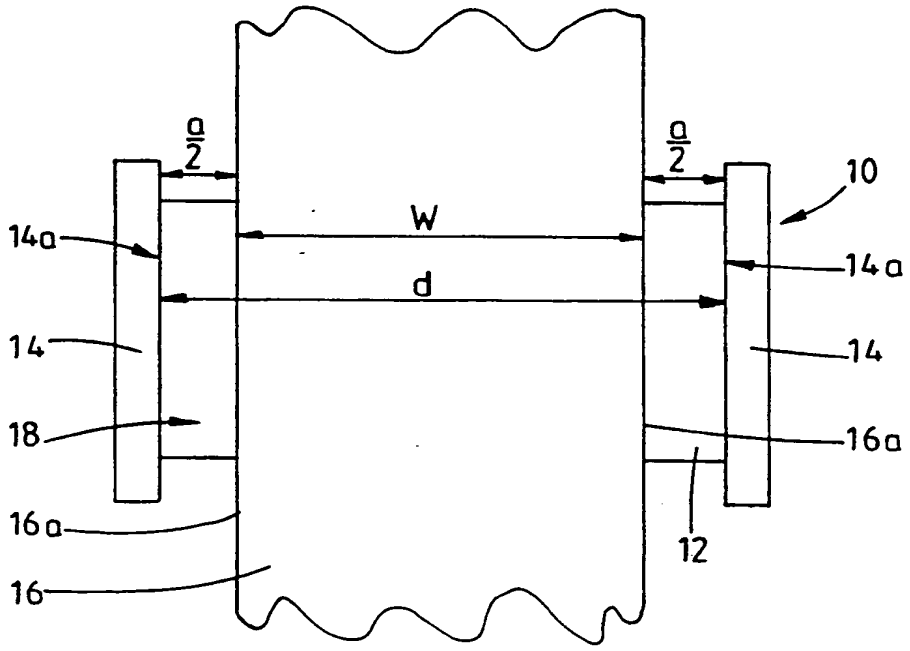

FIG. 2.

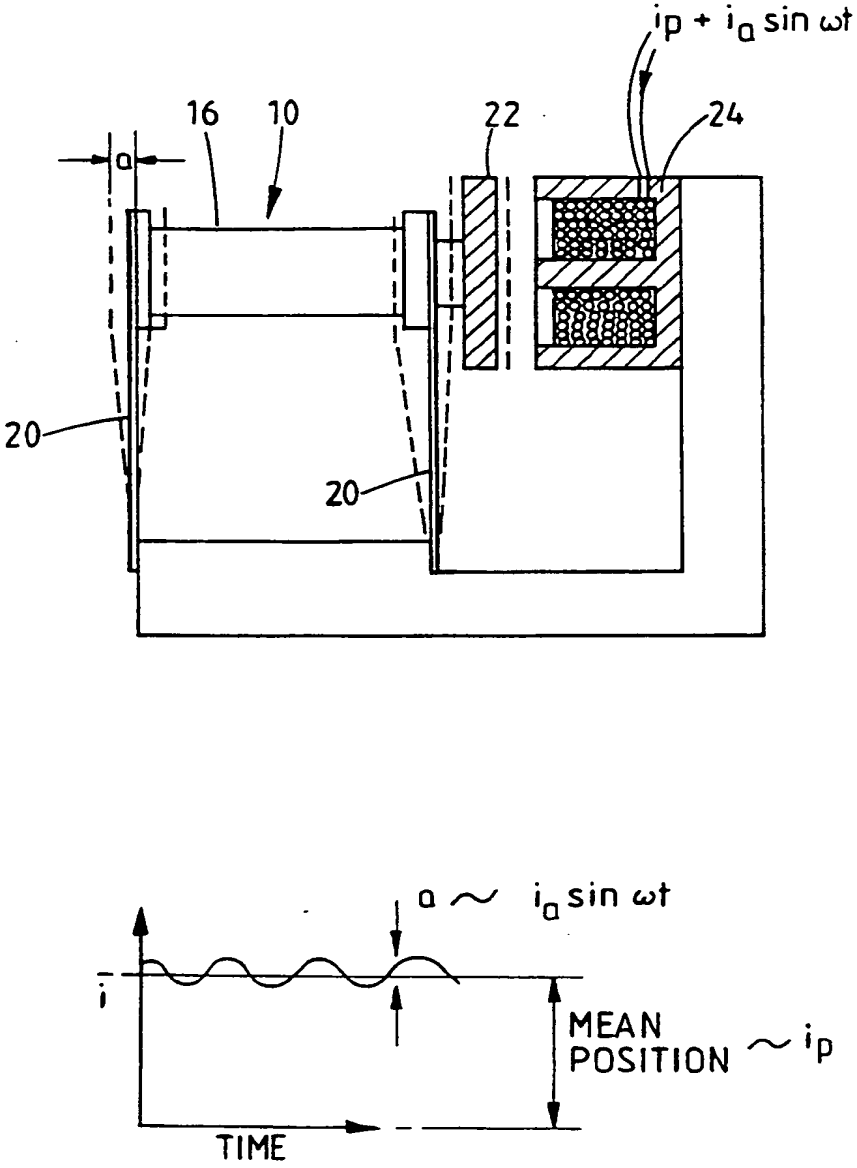

FIG.3.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 94/00209

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 G11B15/60

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 5 G11B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE,C,33 36 921 (K.DINTER) 2 May 1985 see column 2, line 14 - column 3, line 24; figures	1-7,10, 11
A	EP,A,0 403 651 (NIPPON HOSO KYOKAI) 27 December 1990 see page 7, line 13 - page 10, line 19; figures	1-4,6,7, 10,11
A	EP,A,0 508 769 (SONY CORP.) 14 October 1992 see abstract; figures	1-5,10, 11

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
25 April 1994	11. 05. 94

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International application No.
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

information on patent family members

International application No.
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